

Hypersonic Free-Flight Measurement of Aeroshell Forces and Flowfields, Phase I

Completed Technology Project (2006 - 2006)



Project Introduction

A Hypersonic Gun Tunnel and laser based high speed imaging systems will be used to generate a unique, free flight, aerodynamic data base of potential Mars aeroshell configurations. These experiments will provide reliable benchmark data for CFD code validation and help aerocapture modeling and optimize aeroshell payload and design. The experiments will be conducted at hypersonic Mach numbers in air and in simulated Martian atmospheric test gases and will cover the hypersonic continuum flow regime. The innovative test results will help improve aerocapture analysis and prediction techniques that will lead to reduced deceleration propellant launch weight, increased payload, and improved delivery accuracy. These improved measurement capabilities will greatly enhance U.S. commercial and military competitiveness in aerospace vehicle design and production, and help regain and stimulate a viable customer-testing base, which will help preserve and improve our national wind tunnel testing infrastructure. These new capabilities will provide significant test data improvements, which will greatly enhance our ability to understand the physical flow phenomena associated complex flows over advanced aerospace vehicles.

Anticipated Benefits

Potential NASA Commercial Applications: During the twenty-first century, industries will thrive in orbit and in space colonies, with research laboratories and manufacturing plants taking advantage of the microgravity environment and new sources of raw materials. If U.S. companies do not lead these activities, others will, putting the U.S. at a commercially competitive disadvantage. To encourage private investment, we must reduce payload and mission costs. Improved aerocapture technology will help achieve this. To maintain a commercial edge, we must improve aerocapture technology for orbit insertion since it provides significant economic advantages over conventional chemical propulsion methods by reducing vehicle mass and mission pay load cost. The improved experimental techniques developed with SBIR support will contribute to cost-effective aeroshell design techniques for aerocapture entry vehicles.



Hypersonic Free-Flight
Measurement of Aeroshell
Forces and Flowfields, Phase I

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission
Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

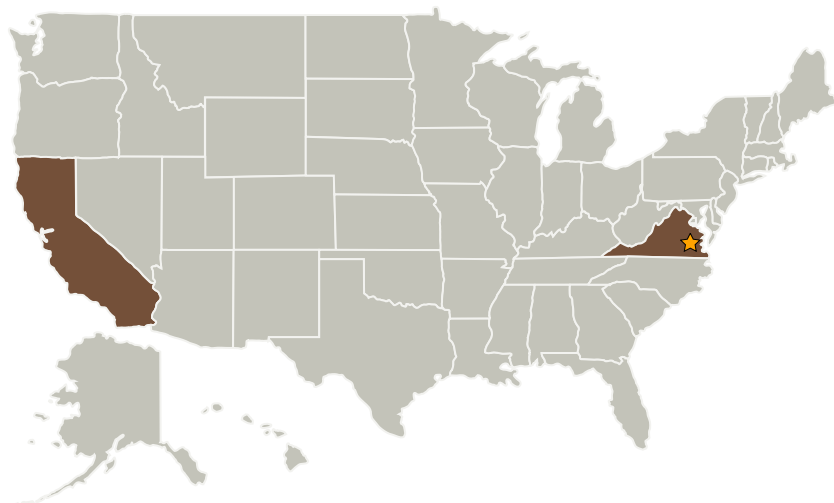
Small Business Innovation
Research/Small Business Tech
Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Complere, Inc.	Supporting Organization	Industry	Pacific Grove, California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

F. Kevin Owen

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.5 Modeling and Simulation for EDL

Primary U.S. Work Locations

California	Virginia
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